

WASHINGTON

# SCIENCE TRENDS

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## TECHNICAL TRENDS

□ Directorate of Procurement, Dayton Air Force Depot, Ohio, is interested in study proposals leading to design of a versatile automatic test equipment system which would automatically check-out the inertial guidance platforms for the Atlas, Titan, Sky Bolt, Hound Dog and Minuteman missile systems. ✓✓ Brig. Gen. Don Flickinger has now been given supervisory authority over the technical program of major Air Force bioastronautic research centers. ✓✓ Congressional Committee staffs have already begun critical studies of plans announced by NASA Administrator T. Keith Glennan to provide private industry interested in commercial uses of communications satellites with vehicles, launching and tracking facilities, and technical services "at cost."

□ Study contracts on feasibility of a Field Army Ballistic Missile Defense System go to six of seventeen interested contractor teams -- Convair, Pomona with Burroughs Corp. and Westinghouse Air Arm Division; General Electric, Radnor, Pa. with Chrysler Corp.; Hughes Aircraft with North American, Aerojet General Nucleonics and R. G. Letourneau; The Martin Co., Orlando, Fla. with the W. L. Maxson Corp., New York; Raytheon, Bedford, Mass. with IBM, Dunlap and Associates, Avco and Northrop and Sylvania, Waltham, Mass. with Aeronutronics, Newport Beach, Calif.

□ Atomic Energy Commission still expresses hopeful optimism on nuclear power prospects. By June 30, 1960, net nuclear power capacity of the U. S. was 225,000 electrical kilowatts. The total is expected to reach about 1,400,000 kw by mid-1965 and about 5,000,000 by 1970. ✓✓ A national Oceanographic Data Center is being established at the Naval Weapons Plant, Washington, D. C. for the collection, study and dissemination of oceanographic information for government, science and industry. Modern data processing equipment will be employed, with a staff of about 80. The Center will be run by the Navy with the cooperation of the U. S. Coast and Geodetic Survey, Atomic Energy Commission, National Academy of Sciences and the Fish and Wildlife Service of the U. S. Interior Department. According to present plans, information obtained will be made available to interested parties, in and out of Government.

□ Two basic research projects (SCIENCE TRENDS, July 4, 1960) have now been awarded to contractors by the U. S. Army Transportation Research Command, Ft. Eustis, Va. RCA Laboratories, Princeton, N. J. receives \$72,904 for basic studies of the volume recombination of cesium ions. ✓✓ Hayes Aircraft, Birmingham, Ala. will conduct a \$70,453 program of basic research in the unusual field of effusion processes as applied to lifting and/or propulsive systems. ✓✓ Vertol Division of Boeing Aircraft receives \$37,458 for research and preliminary design of a Ground Effect Take-Off and Landing aircraft in which the landing gear system would use the peripheral jet principle to form an air cushion.

\* NAVY SEEKS R&D SOURCES

The U. S. Navy Hydrographic Office is seeking firms with research and development qualifications in a number of fields. The objective is the future procurement of the following equipment:

- ✓ Shipboard Wave Sensor -- to measure wave heights from surface ships by electronic or acoustic means. (Company must have previous experience in stabilization or gyroscopic work.)
- ✓ Universal Underwater Connector -- to be used for deep sea and shallow water transducers. (Company must have experience in high pressure and water tight integrity instrumentation connectors.)
- ✓ Electronic Bathythermograph -- for measuring ocean temperature versus depth by electronic means. (Company must have telemetry experience.)
- ✓ Thermistor Buoys -- to serve as sea surface temperature recorders. (Company must have small boat capabilities with electronic background.)
- ✓ Digital Plotter -- with one standard and one small size printing head of approximately 40 x 60 inches plotting surface. (Company must have plotter and computer experience.)
- ✓ Bottom Reflectivity Meter -- to measure reflection of sound waves from bottom of ocean. (Company must have echo sounding and bottom sounding acoustic equipment experience.)
- ✓ Moored Boat Station -- to serve as an open ocean transducer carrier. (Company must have small boat capability and R&D experience in new-type power supplies.)
- ✓ FM/FM Data Recording System -- to record, process and broadcast transducer measurements. (Telemetry experience required.)
- ✓ High Speed Bathythermograph -- to measure subsurface sea temperatures from high speed ships. (Capabilities in underwater self-propelled housings with an electronic background required.)
- ✓ Airborne Sea Swell Recorder -- to measure wave heights from aircraft. (Company must have airborne radar background.)
- ✓ Free Vehicle -- to carry transducers independently over open ocean. (Company must have experience in telemetry and underwater self-propelled housings, with an electronics background.)
- ✓ Solid State Current Speed and Direction Indicator -- (Company must have experience in solid state physics.)
- ✓ Wave Staff -- to measure waves from fixed positions. (Company must have experience in electronic packaging production.)

Other -- Helicopter Small Winch and Electric Cable Reels from companies that have experience in winch production -- and various types of Instrumentation Calibration Equipment.

(Interested organizations should submit the following information by October 21, 1960 to U. S. Navy Hydrographic Office, Code 1713, Washington 25, D. C. Information should be identified and duplicated for each item of interest: Total number of employees, professional qualifications of scientists and engineers and technical personnel; description of general and special facilities; outline of previous projects; statement regarding security clearance and other available descriptive literature.)

#### \* MEASURING HELIUM IMPURITIES

The U. S. Bureau of Mines has developed an "exceptionally accurate" device for measuring minute impurities in Grade-A helium, which is expected to be of value in checking purification equipment used in missile testing, wind-tunnel operation and atomic reactor cooling.

The new apparatus for analyzing trace impurities is said to be capable of making a determination of one part per million. The device is relatively simple and compact and features a trap cooled by liquid helium which solidifies the impurities and permits their separate removal from the helium gas. This is possible because helium has a much lower freezing point than neon, carbon dioxide, hydrogen and other gaseous impurities usually present.

Only a small amount of liquid helium is required -- a quart is sufficient to run six tests. After the contaminants have been captured they are analyzed in a routine manner by a mass spectrometer.

(Full technical details available. Single Copies Free. Write Publications-Distribution Section, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa., For Information Circular No. 5644 "Determining Trace Impurities in Grade-A Helium")

#### \* MEASURING MICROWAVE ATTENUATION

Researchers at the National Bureau of Standards, Boulder, Colo. believe they have perfected a technique which virtually eliminates environmental influences in comparing two methods of measuring microwave attenuation.

One technique is an ultraprecise power attenuation measurement system, which was used as the reference in testing the second technique -- a recently developed subcarrier system for measuring attenuation. The Bureau believes that both systems are significantly more precise than other methods now in use. Comparison shows that measurements made with the two agree within 10 microbels.

Both attenuation measurement methods use a two-channel waveguide system. The Bureau states that the low power required by the subcarrier technique may be "borrowed" from a power measurement system by directional couplers without disturbing the latter. This means that the test attenuator can be placed in one channel which is common to both systems. This is said to eliminate environmental effects and mismatch errors -- and minimizes the "re-settability" limits of the attenuator when making comparisons.

(Write National Bureau of Standards, Office of Technical Information, Washington 25, D. C. for information on "Comparison of Two Techniques for Measuring Microwave Attenuation")

#### \* PROJECT VELA

Project Vela, a research and development program aimed at solution of technical problems connected with the nuclear test ban (SCIENCE TRENDS, June 27, 1960) is entering into the operational phase. The Geotechnical Corp., Garland, Tex. has completed construction of a prototype detection station near Fort Sill, Okla. -- the Wichita Mountains Seismological Observatory. The station is equipped with 21 seismometers in an array -- each placed in a water and pressure-tight vault situated in a shallow excavation with the detector resting on solid bed rock. A short-period Benioff seismometer can detect vertical earth motions as small as 0.0000001 of an inch, at a frequency of about one oscillation per second. A Sprengnether, or long-period seismometer can detect vertical earth motions at about one oscillation per 30 seconds.

## RESEARCH CHECKLIST

- SILICON CARBIDE TRANSISTOR: Studies for the U. S. Air Force have resulted in laboratory development of a silicon carbide transistor, said to be the first capable of operating above 650° Fahrenheit. An upper operating temperature of more than 925° F. is anticipated. The so-called "unipolar" transistors are said to provide a power gain of about 60 at room temperatures. Junctions are established by exposing carefully selected silicon carbide crystals to vaporized aluminum at 3900° F. The aluminum atoms then diffuse into the crystal, changing its electrical behavior from so-called n-type material to p-type. The junction is formed where the two types meet.
- (R&D for Electronic Research Directorate, Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. Reported by H. C. Chang and L. F. Wallace, Westinghouse Materials Laboratories, Pittsburgh, Pa.)
- INSECT ATTRACTANT SYNTHESIZED: The U. S. Agricultural Research Service has successfully synthesized an insect attractant that provides promise of low-cost control of the gypsy moth. The synthetic compound, identified as an ester alcohol, is said to be identical to the natural attractant, except that it is not optically active. An effective, and closely related compound known as Gyplure can be produced by starting with ricinoleyl alcohol, an inexpensive chemical now available commercially, or ricinoleic, a major constituent of castor oil.
- (For further information write Information Office, U. S. Department of Agriculture, Washington 25, D. C. Ask for USDA Release 2953-60)
- SOLID TANTALUM CAPACITORS: Studies at the U. S. Army Signal Research and Development Laboratories indicate increasing military usage for solid tantalum capacitors. These devices utilize a solid, semi-cathodic phase in place of the wet and paste electrolytes found in conventional electrolytic capacitor designs. The miniature capacitors are expected to prove particularly valuable in transistor applications, where low voltages and small sizes are an advantage. For equivalent electrical ratings, the solid tantalum capacitor can provide volume reduction ranging from 30% to 50%.
- (A 1959 survey of capabilities and limitations with respect to operating temperatures, electrical leakage, dissipation factors, stability and life is now available. 14 Pages. 50 Cents. Write OTS, U. S. Department of Commerce, Washington 25, D. C. for USASRD Technical Report No. 2073)
- ARC-IMAGE FURNACE: Research by the National Aeronautics and Space Administration has resulted in development of an arc-image furnace for the study of the elevated temperature behavior of engineering materials. The furnace consists of two paraboloidal search light mirrors, 60 inches in diameter, and a modified electrode mechanism. The unit provides a wide range of heating rates at current levels ranging from 80 to 550 amperes. A sealed specimen chamber permits evaluation of materials in atmospheres of inert gases, pure oxygen or air at elevated or subatmospheric temperatures.
- (Technical Report Available. Write National Aeronautics and Space Administration, Attn: Code BID, Washington 25, D. C. for NASA Technical Note D-505 -- Characteristics of a 60-Inch Arc-Image Furnace)

- UNDERWATER PHOTOGRAPHIC SPECTROPHOTOMETER: Research at the U. S. Naval Ordnance Test Station, China Lake, Calif. has resulted in development of a device for the direct measurement of the spectral composition of transmitted and scattered light at various ocean depths. The equipment includes a wedge interference filter used as the analyzing element, and this is said to make possible relatively high photographic recording speed and simultaneous recording of intensities throughout the visible spectrum. The work is expected to lead to new knowledge of optimum combinations of film types, lighting and filters for underwater photography.

(Technical Report, including details of equipment, now available through Navy channels or at 50 cents from OTS, U. S. Department of Commerce, Washington 25, D. C., Ask for NAVORD Report 7040)

- DIGITAL WATER STAGE RECORDER: The U. S. Geological Survey is completing development of a digital water-stage recorder for use in its studies of river action. River stages are punched on a tape at predetermined intervals of time -- as many as 96 stages a day on the current model. Officials state that it is conceivable the digital recorder will largely replace the present recorder which gives a continuous line tracing of the river stage. Feeding the tape from the digital recorder directly into an electronic computer eliminates the laborious hand computation of daily river discharge, one of the Survey's responsibilities.
- FLAME SPRAYING OF ALUMINA: The Air Force is sponsoring studies of the basic principles involved in the flame-spray process of coating metals with alumina for the thermal protection of jet and rocket engine components and the regulation of temperature within space vehicles. The work has already demonstrated the important influence of the temperature and velocity of particles in the spray as well as their cooling rate. The studies also suggest that the bond between the alumina coating and glass substrate is largely chemical, while the bond formed between flame-sprayed alumina and metals is mechanical. A byproduct of this investigation has been the development of a rotating disk velocimeter for determination of particle velocities.

(Write National Bureau of Standards, Office of Technical Information, Washington 25, D. C. for further details of Flame-Spraying of Alumina)

- DUAL SENSOR GAMMA RAY CALORIMETER: Researchers at the Wright Air Development Division, U. S. Air Force, have developed an inexpensive and reliable dosimeter for use in high gamma flux fields. It is said to have a number of advantages over devices which employ ion chambers or chemical means, as well as a few advantages over other types of calorimeters. The device permits changing both the time response and sensitivity by selection of different materials, and varying the dimensions of the sensing slugs and heat leak.

(Technical Report, including details of equipment, now available through Air Force channels or at 50 cents from OTS, U. S. Department of Commerce. Ask for WADD Technical Note 60-48 - Design of a Dual Sensor Gamma Ray Calorimeter)

## P U B L I C A T I O N   C H E C K L I S T

- FIELD EMISSION OF ELECTRONS, a comprehensive bibliography of abstracts from 1897 to the present day. The study is concerned with electron emission rather than ion emission, and the quantity and techniques of both direct current fields and radio-frequency fields are included. 115 Pages. (Available through AEC channels or at \$2.25 from OTS, U. S. Department of Commerce, Washington 25, D. C. Ask for LAMS-2385)
- STEELS, an excellent Material Properties Handbook prepared for the North Atlantic Treaty Organization dealing with steels which are of most interest for structural use in aircraft. Does not include steels which are used only for castings or for rivets. Covers properties of steels produced by Canada, France, Germany, Italy, United Kingdom and U. S. Single copies free while limited supply is available. (Write National Aeronautics and Space Administration, ATTN: CODE BID, Washington 25, D. C. for AGARD Materials Properties Handbook -- Volume II--Steels)
- GOVERNMENT RESEARCH BIBLIOGRAPHIES, the following selective bibliographies listing Government research reports and other technical documents available to science and industry may now be obtained (at 10 cents each) from OTS, U. S. Department of Commerce, Washington 25, D. C.:
  - SB-409 Metal Coatings (1950-60)
  - SB-411 Materials Testing (1950-1960)
  - SB-412 Food Preservation (Except by Irradiation)
  - SB-413 Beryllium (1945-1960)
  - SB-416 Photogrammetry
- HYDRAULIC RESEARCH, the latest in a series of annual publications reporting on hydraulic research conducted by various laboratories in the U. S. and Canada. A useful guide in the coordination and planning of hydraulics research. 190 Pages. \$1. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for NBS Misc. Pub. 231)
- CIVIL DEFENSE, a congressional report on civil defense shelter policy and postattack recovery planning, including a discussion of the survival of ICBM bases. 46 Pages. Single Copies Free. (Write Committee on Government Operations, U. S. House of Representatives, Washington 25, D. C. for House Report No. 2069)
- FREE RADICALS, a review of the three-year program in free radicals research based on papers presented at a symposium in Washington August 31 - Sept. 2, 1959. Includes an interesting description of the technical management of the program, which permitted investigators an unusual degree of freedom. 110 Pages. \$1.50. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for NBS Monograph No. 12)
- SAFETY AT GAS PROCESSING PLANTS, a new safety manual describing the design, construction, operation and maintenance of natural gasoline and natural gas-processing plants and emphasizing procedures, practices and other elements for safeguarding workers. 50 Cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Bureau of Mines Bulletin No. 588)

